REMARKS

Favorable reconsideration of this application as presently amended and in light of the following discussion is respectfully requested.

Claims 1-22, and 24-30 are pending active examination. Claims 1, 7-10, 12, 15-16, 18-20, 25, 28, and 29 are amended to provide a clearer presentation of the claimed subject matter. Applicant submits that no new matter has been added. Claims 23 and 27 are canceled without prejudice or disclaimer. Claim 30 is withdrawn from consideration as being drawn to non-elected inventions. No new claims have been added.

In the Office Communication dated August 1, 2008 pertaining to the Decision on Appeal rendered by The Board of Patent Appeals and Interferences for the present application, claims 1-22 and 24-29 stand rejected under 35 U.S.C. §103(a), as allegedly being unpatentable over Tomoyasu '583 (U.S. Patent Application Publication 2004/0185583 A1); claims 1, 4-8, 10-12, 15-19, 21-22, and 24-28 stand rejected under 35 U.S.C. §103(a), as allegedly being unpatentable over Newton '377 (U.S. Patent Application Publication 2004/0099377 A1); claims 1, 4-12, 15-22, and 24-29 stand rejected under 35 U.S.C. §103(a) over Natzle '047 (U.S. Patent Application Publication 2004/0097047 A1) in view of Newton '377; and claims 2-3 and 13-14 stand rejected under 35 U.S.C. §103(a) over Natzle '047 in view Newton '377 and Doris '981 (U.S. Patent Application Publication 2004/0241981 A1).

To be clear and to the point, the prior art rejections are improper and must fail for at least the reason that none of the asserted references, whether taken alone or in combination, teach or suggest the entire claimed combination of elements as currently amended. Accordingly, Appellants respectfully traverse the outstanding rejections set forth by the Examiner.

Appellants further submit that, at the very least, none of the asserted references teach or suggest:

> setting a process recipe for ***performing*** said chemical oxide removal process in ***two or more different processing regimes that facilitate different ranges of trim amount***, said process recipe comprising a ***static recipe component*** and a ***formula model component*** for each of said two or more different processing regimes, wherein said setting said process recipe comprises setting an amount of a first process gas and setting an amount of a second process gas for said static recipe component in each of said two or more different processing regimes;
>
> ***determining a relationship between a trim amount of said feature and an amount of an inert gas*** for said formula model component in each of said two or more different processing regimes,

wherein said relationship is established for said amount of said first process gas and said amount of said second process gas in said static recipe component of each of said two or more different processing regimes;

adjusting said process recipe for said chemical oxide removal process in order to achieve a target trim amount by ***selecting one of said two or more different processing regimes*** and ***setting an amount of an inert gas using said relationship*** of said formula model component for said selected one of said two or more different processing regimes [Emphasis Added].

Nor is there anything in the asserted references that teach or suggest:

determining a relationship between a trim amount of said feature and an amount of an inert gas ***for two or more different processing regimes that facilitate different ranges of trim amount***, wherein each said relationship is established for an amount of a first process gas, and an amount of a second process gas;

selecting a target trim amount;

selecting one of said two or more different processing regimes using said target trim amount;

selecting a target amount of inert gas for achieving said target trim amount using said relationship ***for said selected one of said two or more different processing regimes*** [Emphasis Added].

Nor is there anything in the asserted references that teach or suggest:

setting a process recipe for ***performing*** said chemical oxide removal process ***in two or more different processing regimes that facilitate different ranges of trim amount***, wherein said setting said process recipe comprises setting an amount of HF, and setting an amount of NH_3;

selecting a target trim amount;

adjusting said process recipe for said chemical oxide removal process in order to achieve said target trim amount by ***selecting one of said two or more different processing regimes*** and setting an amount of argon, wherein said selecting one of said ***two or more different processing regimes depends on a sensitivity of said trim amount to said amount of argon near said target trim amount*** [Emphasis Added].

The Examiner asserted that Tomoyasu '583 renders claims 1-22 and 24-29 unpatentable as the reference allegedly teaches or suggests each and every claim element. Appellants respectfully submit that these rejections are woefully unsupported. In particular, the grounds of rejections rest squarely on the Examiner's assertions that Tomoyasu '583 teaches setting an amount of an inert gas in order to achieve the trim amount (Tomoyasu '583: par. [**0007**]) and teaches adjusting the amount of inert gas in order to remove the desired amount of chemical oxide (Tomoyasu '583: par. [**0007**], [**0074**]). (*See*, Final Office

Action, pages 3-4). The Examiner further asserted that Tomoyasu '583 teaches the use of the claimed gases and combinations thereof and that the reference shows that process parameters and compositions of chemical treatment gases are result-effective variables, which are obvious to artisans of ordinary skill. (*See*, Final Office Action, pages 9-10). Such assertions are either inaccurate or simply miss the point.

In particular, Tomoyasu '583 teaches a processing subsystem **150** that includes a Chemical Oxide Removal (COR) module **154** and a Post Heat Treatment (PHT) chamber **156**. The COR module **154** performs the first step of the COR process, which is a reaction between a mixture of process gases, such as HF and ammonia gases, and silicon dioxide that forms a solid reaction product on the wafer surface. The PHT module **156**, performs the second step of the COR process, which causes the evaporation of the solid reaction product by heating the wafer. (*See*, Tomoyasu '583: par. [**0052**]).

Tomoyasu '583 further discloses that a predicted state for the wafer may be computed based on the input state, the process characteristics, and a process model. For example, a trim rate model can be used along with a processing time to compute a predicted trim amount. Alternately, an etch rate model can be used along with a processing time to compute an etch depth, and a deposition rate model can be used along with a processing time to compute a deposition thickness. Other models identified by Tomoyasu '583 include SPC charts, PLS models, PCA models, FDC models, and MVA models. (*See*, Tomoyasu '583: par. [**0074**]).

With regard to the use of inert gases, and in glaring contrast to the Examiner's cited passages, the few instances in which Tomoyasu '583 actually mentions the use of an "inert gas" (*e.g.*, argon) is in connection with the orifice configurations of the gas distribution system and the possible use of a heat transfer gas. That is, Tomoyasu '583 discloses that the first and second arrays of one or more orifices **1444**, **1448** are configured to distribute gas, which can, for example, comprise NH_3, HF, H_2, O_2, CO, CO_2, Ar, He, *etc.* (*see*, Tomoyasu '583: par. [**0200**]) and that a heat transfer gas may be delivered to the back-side of substrate **1242** via a backside gas system to improve the gas-gap thermal conductance between substrate **1242** and substrate holder **1240** (*see*, Tomoyasu '583: par. [**0195**]). The heat transfer gas supplied to the back-side of substrate **1242** can comprise an inert gas such as helium, argon, xenon, krypton, a process gas such as CF_4, C_4F_8, C_5F_8, C_4F_6, *etc.*, or other gas such as oxygen, nitrogen, or hydrogen.

It should be clear that such teachings have nothing to do with determining the relationship between a trim amount and ***an amount of an inert gas***, as required by claims 1 and 12. There is nothing in the brief discussion that could possibly lead those skilled in the art to understand or determine the relationship between the trim amount and the amount of an inert gas, among other features. It is the absence of a discussion or suggestion of a nexus or connection between these parameters, among others, that clearly undermine the Examiner's assertions.

Moreover, with regard to the Tomoyasu '583 trim rate models used to compute predicted trim amount, there is, once again, nothing to suggest that these models are based on any relationship other than trim amounts and processing "reactive" gases (*i.e.*, HF or NH_3). As such, Tomoyasu '583 cannot be construed as teaching a relationship between a trim amount and an amount of ***an inert gas*** – much less, that the relationship is determined for ***two or more processing regimes***, and much less, that the relationship is determined via curve-fitting either the trim amount data as a function of ***the amount of the inert gas*** or ***the amount of the inert gas*** as a function of the trim amount data, as also required by claims 1 and 12.

For at least similar reasons, Tomoyasu '583 fails to teach adjusting the process recipe for the chemical oxide removal process in order to achieve the trim amount by setting ***an amount of argon*** and substantially removing the trim amount from the feature, wherein ***increasing the amount of argon*** corresponds to decreasing the trim amount, as required by claim 29. As noted above, argon is mentioned as a possible heat transfer gas, but in no way does Tomoyasu '583 relate it to achieving a trim amount.

Moreover, as best understood, there is nothing in Tomoyasu '583 that specifically teaches chemically treating the feature on the substrate by exposing the substrate using the process recipe, wherein the amount of HF is introduced independently from the amount of the NH_3, ***and the amount of argon is introduced with the amount of*** NH_3, as required by claim 29.

For at least these reasons, Appellants submit that the Examiner has not presented a *prima facie* case of obviousness with respect to independent claims 1, 12, and 29 and that these claims are not rendered obvious by Tomoyasu '583. As such, claims 1, 12, and 29 are clearly patentable. Moreover, because claims 2-11 and claims 13-22, 25-28 depend from

claims 1 and 12, respectively, claims 2-11 and claims 13-22, 25-28 are also patentable at least by virtue of dependency as well as for their additional recitations.

The Examiner asserted that Newton '377 renders claims 1, 4-8, 10-12, 15-19, 21-22, and 24-28 unpatentable by alleging that the reference teaches or suggests each of the claimed elements, including determining a ***relationship between a trim amount and an amount of an inert gas*** and that the relationship is determined via curve-fitting either the ***trim amount data as a function of the amount of the inert gas or the amount of the inert gas as a function of the trim amount data***, as required by claims 1 and 12. Appellants strenuously disagree.

Newton '377 is directed to an apparatus and method that provides controlled etching of an adapted surface layer of a workpiece or wafer by reaction of the adapted surface layer with ammonium bifluoride (NH_5F_2), forming a self-limiting etchable layer, ammonium hexafluorosilicate, ($(NH_4)_2SiF_6$), that may be removed by thermal desorption, in which NH_5F_2 may be formed by mixing a first fluid, ammonia (NH_3) and a second fluid, hydrogen fluoride (HF). (*See*, Newton '377: par. [**0026**]).

Newton '377 discloses a chamber **7** that includes a sandwich **119** of an electrostatic chuck **110**, and upper annular ring **103**, a cathode insulator **105**, and a lower annular ring **125** that contains a plurality of exhaust holes **127** for distributing an exhaust flow provided by a vacuum pump through the exhaust port **83**. The exhaust flow that originates from the exhaust port **83** and distributed through the plurality of exhaust holes **127** of the lower annular ring **125**, resulting in a uniform or homogeneous atmosphere of reactive fluids over the workpiece **30** in the chamber **7**. (*See*, Newton '377: par. [**0050**]; FIG. 4).

Newton '377 further discloses that "reactive fluids" refer to the first fluid, the second fluid, in which the first or second fluids may be ammonia (NH_3) or hydrogen fluoride (HF) and ammonium bifluoride (NH_5F_2) and combinations thereof. Providing the reactive fluids over the adapted surface layer **32** of the workpiece **30**, as a uniform or homogeneous atmosphere, forms the self-limiting etchable layer **50** that includes layers made of materials such as ammonium hexafluorosilicate ($(NH_4)_2SiF_6$), that may become impervious to continued exposure to hydrogen fluoride (HF). Such imperviousness is the basis for the layer **50** being a self-limiting etchable layer. (*See*, Newton '377: par. [**0050**]; FIG. 4).

Regarding the use of inert gases, Newton '377 merely discloses that fluid feed lines **97**, **99** or chamber **7** may be optionally provided with Ar or N_2 gas. (*See*, Newton '377: par. [**0034**], [**0073**]). Appellants remain at a loss as to how the mere mention of these gases that would somehow lead those skilled in the art to understand or determine the nature of the relationship between the trim amount and the amount of an inert gas, among other features. There is simply nothing in Newton '377 that suggests determining a relationship between a trim amount and ***an amount of an inert gas,*** much less, that the relationship is determined for ***two or more processing regimes***, and that the relationship is determined via curve-fitting either the trim amount data as a function of ***the amount of the inert gas or the amount of the inert gas*** as a function of the trim amount data, as required by claims 1 and 12.

For at least these reasons, Appellants submit that the Examiner has not presented a *prima facie* case of obviousness with respect to independent claims 1 and 12 and that these claims are not rendered obvious by Newton '377. As such, claims 1 and 12 are clearly patentable. Moreover, because claims 2-11 and claims 13-22, 25-28 depend from claims 1 and 12, respectively, claims 2-11 and claims 13-22, 25-28 are also patentable at least by virtue of dependency as well as for their additional recitations.

The Examiner alleged that Natzle '047 teaches the use of a process recipe including setting an amount of first and second process gases and acquiring data as a function of variable parameters. The Examiner acknowledged that Natzle '047 fails to teach or suggest the use of inert gas and, therefore, relied on Newton '377 to allegedly render claims 1, 4-12, 15-22, & 24-29 unpatentable. (*See*, Final Office Action: page 7). Appellants strenuously disagree.

For these rejections, Appellants substantially rely on the reasons presented above regarding Newton '377. In short, Natzle '047 discloses the use of a pre-cleaning step by introducing a CMOS device **10** into a Chemical Oxide Removal (COR) chamber **44**, which employs gas phase reactants (*e.g.*, HF and NH_3) to perform a self-limiting etch that is adjustable by controlling the parameters in the COR chamber **44**. (*See*, Natzle '047: par. [**0037**]). Natzle '047 further discloses that the completion of the reaction and the amount of the gate dielectric layer **14** and the reoxidized silicon oxide layer **18** that are removed is a function of the substrate temperature, composition and residence time of the adsorbed reactant film **20**. Factors influencing the amount removed per unit time include the vapor

pressure of the reactant at the temperature of the substrate **12**, the amount of reactant or the rate of reactant admitted to the COR chamber **44**, the pumping speed of pump **60**, and the reaction rate between the adsorbed reactant film **20** and the reoxidized silicon oxide layer **18** to be etched. (*See*, Natzle '047: par. [**0042**]).

However, as admitted by the Examiner, there is nothing in Natzle '047 that remotely teaches or suggests the use of inert gases. And, for the reasons noted above, Newton '377 is incapable of curing these deficiencies. That is, the mere mention of Ar or N_2 gas is simply not enough to defeat patentability, as there is nothing in Newton '377 that suggests determining a relationship between a trim amount and ***an amount of an inert gas***, much less, that the relationship is determined for ***two or more processing regimes***, and that the relationship is determined via curve-fitting either the trim amount data as a function of ***the amount of the inert gas or the amount of the inert gas*** as a function of the trim amount data, as required by claims 1 and 12.

For similar reasons, both Natzle '047 and Newton '377 fail to teach adjusting the process recipe for the chemical oxide removal process in order to achieve the trim amount by setting ***an amount of argon*** and substantially removing the trim amount from the feature, wherein ***increasing the amount of argon*** corresponds to decreasing the trim amount, as required by claim 29. As noted above, Natzle '047 is silent as to the use of any inert gas, including Ar, and Newton '377 merely mentions optionally providing fluid feed lines or a chamber with Ar. None of these references remotely teach the relationship between the increase in Ar and the decrease in trim amount.

Moreover, as best understood, there is nothing in Natzle '047 and Newton '377 that specifically teach chemically treating the feature on the substrate by exposing the substrate using the process recipe, wherein the amount of HF is introduced independently from the amount of the NH_3, ***and the amount of argon is introduced with the amount of NH_3***, as required by claim 29.

For at least these reasons, Appellants submit, once again, that the Examiner has not presented a *prima facie* case of obviousness with respect to independent claims 1, 12, and 29 and that these claims are not rendered obvious by the combination of Natzle '047 and Newton '377. As such, claims 1, 12, and 29 are clearly patentable. Moreover, because claims 2-11 and claims 13-22, 25-28 depend from claims 1 and 12, respectively, claims 2-11 and

claims 13-22, 25-28 are also patentable at least by virtue of dependency as well as for their additional recitations.

Lastly, the Examiner alleged that the combination of Natzle '047, Newton '377 and Doris '981 teach or suggest each and every element of dependent claims 2-3 and 13-14.

Appellants substantially rely on the reasons presented above regarding the patentability of independent claims 1 and 12. Thus, based on the aforementioned reasons, Appellants respectfully submit that claims 2-3 and 13-14, which depend from claims 1 and 12, respectively, are also patentable at least by virtue of dependency as well as for their additional recitations.

CONCLUSIONS

Consequently, in view of the present amendment, no further issues are believed to be outstanding in the present application, and the present application is believed to be in condition for formal allowance. An early and favorable action is therefore respectfully requested.

Should the Examiner have any questions or deem that any further action is necessary to place this application in even better form for allowance, the Examiner is encouraged to contact the undersigned representative at the below listed telephone number.

Charge Deposit Account

Please charge our Deposit Account No. 50-3451 for any additional fee(s) that may be due in this matter, and please credit the same deposit account for any overpayment.

Respectfully submitted,

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